



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,079	08/21/2006	Takashi Goto	291650US0PCT	8078

22850 7590 04/15/2011
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

RIPA, BRYAN D

ART UNIT	PAPER NUMBER
----------	--------------

1723

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

04/15/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary

Application No.

10/590,079

Applicant(s)

GOTO ET AL.

Examiner

BRYAN D. RIPA

Art Unit

1723

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 January 2011.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 14, 15 and 17-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 14, 15 and 17-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

In response to the amendment received on January 26, 2011:

- claims 1, 14, 15 and 17-24 are presently pending
- all prior art rejection are withdrawn in light of the amendments to the claims
- new grounds of rejection are set forth below

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 1, 14, 15 and 17-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, the claim has been amended to recite the particle dispersed complex wherein the matrix consisting of carbon black is obtained by "thermal chemical vapor deposition" (see line 3 of amended claim 1). For support for the claim limitation the Applicant points to claim 15 and pages 8-9 of the specification (see Remarks at page 5 lines 2-3); however, in the claim and the cited pages of the specification the

Examiner has been unable to locate explicit support for the claim limitation requiring the chemical vapor deposition (“CVD”) process to be a thermal CVD process. Furthermore, while the Examiner appreciates that support for claim amendments does not have to be explicit (see MPEP §2163 (I)(B)), based on U.S. Pat. No. 5,372,849 to McCormick et al., (hereinafter referred to as “McCORMICK”) it appears that a thermal CVD process includes types of CVD processes other than that disclosed and described in Applicant’s specification at figure 1 and pages 8 and 9 (see McCORMICK at col. 10 lines 34-40 teaching thermal CVD processes including radiation beam CVD reactors)

As a result, to the extent the claim term “thermal CVD” includes chemical vapor deposition processes beyond that disclosed by Applicant’s specification, such additional scope of the claim term appears to be unsupported by the specification as originally filed and would therefore constitute new matter as explained.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1, 14, 15 and 17-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, the Examiner is of the opinion that the use of the phrase “carbon black” in describing the carbon makeup of the matrix is unclear since carbon black as used in the art specifically refers to a powder form of amorphous carbon (see Definition

of carbon black as contained in Definition Reference) and not a matrix of carbon as disclosed in applicant's specification and presently claimed.

Moreover, as exemplified by Applicant's published paper already of record titled "Preparation of Ru-C Nano-Compoasite [sic] Film by MOCVD and Electrode Properties for Oxygen Gas Sensor" in *Materials Science Forum*, vol. 534-536 pages 1485-1488 (2007) disclosing a ruthenium carbon matrix produced by a similar CVD process to the claimed invention describing the carbon matrix as being an "amorphous matrix" (see page 1486 in discussion relating to Figure 3), referring to the carbon matrix.

It is the Examiner's opinion that the term "carbon black" is meant to refer to the matrix as containing amorphous carbon and not actually carbon black, a powder form of amorphous carbon, as presently claimed. Please note that in interpreting the claim term the Examiner will be interpreting carbon black to merely require the matrix to be an amorphous carbon matrix.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 14, 15 and 17-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Preparation of Iridium Films by MOCVD and Their Application for Oxygen Gas Sensors" by Goto et al., *Inorganic Materials* 33(10) pages 1017-1021 (1997) (hereinafter referred to as "GOTO") in view of Jain et al., (U.S. Pub. No.

2003/0230484) (hereinafter referred to as "JAIN") and Kawano et al., (U.S. Pub. No. 2003/0088116) (hereinafter referred to as "KAWANO") with evidence from "Effect of Oxygen Gas Addition on Preparation of Iridium and Platinum Films by Metal-Organic Chemical Vapor Deposition" by Goto et al., *Materials Transactions, JIM* 40(3) pages 209-213 (1999) (hereinafter referred to as "GOTO II") and "Evaluation of Precursors for Chemical Vapor Deposition of Ruthenium" by Smith et al., *Thin Solid Films* 376 pages 73-81 (2000) (hereinafter referred to as "SMITH") which is already of record.

Regarding claims 1 and 15, GOTO teaches a method of making a particle dispersed complex similar to the method of making the presently claimed particle-dispersed complex wherein a matrix consisting of amorphous carbon is obtained by a thermal CVD process (see page 1017-1018), with the matrix including metallic particles dispersed in and surrounded by the matrix (see page 1018).

While GOTO teaches the use of metal particles of iridium (see abstract), GOTO does not explicitly teach the use of ruthenium particles wherein the particles and the matrix have the claimed structural features.

However, JAIN teaches that the use of noble metal catalysts such as iridium and ruthenium are known oxygen ionizing catalysts employed in the electrodes in solid electrolyte oxygen sensors (see ¶26-¶28 and ¶32 teaching the disclosure relating to a solid electrolyte oxygen sensor in which the catalytic material in the reference and measuring electrode includes iridium and ruthenium amongst other catalytic materials known to catalyze the dissociation oxygen gas).

Additionally, the known grouping of iridium and ruthenium as both noble metals and platinum group metals due to the similar properties that the two metals exhibit would have led one of ordinary skill in the art to consider the two as effective equivalents or, at a minimum, metals in which it would have been obvious to try one in place of the other.

The combination of familiar elements is likely to be obvious when it does no more than yield predictable results. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP §2143, A.).

Also, the Supreme Court decided that a claim can be proved obvious merely by showing that the combination of known elements was obvious to try. In this regard, the Supreme Court explained that, “[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has a good reason to pursue the known options within his or her technical grasp.” An obviousness determination is not the result of a rigid formula disassociated from the consideration of the facts of the case. Indeed, the common sense of those skilled in the art demonstrates why some combinations would have been obvious where others would not. Therefore, choosing from a finite number of identified, predictable solutions, with a reasonable expectation for success, is likely to be obvious to a person of ordinary skill in the art. See *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395–97 (2007) (see MPEP §2143, E.).

Moreover, the teachings of GOTO relating to improved chemical properties of the iridium-carbon complex over the conventional platinum electrodes (see generally pages

1019-1021; see abstract) would have lead one of ordinary skill in the art to consider the use of other known catalytic metals such as ruthenium for use in the carbon complex as an electrode material. Furthermore, since ruthenium was a known catalytic metal for the dissociation of oxygen usable in solid electrolyte oxygen sensors, one of ordinary skill in the art would have reasonably expected that the use of ruthenium carbon electrode would have worked as an electrode for a solid electrolyte oxygen gas sensor.

As to the product-by-process limitations of claim 15, while GOTO teaches the deposition temperature, i.e. the substrate temperature, being from approximately 500 °C to 700 °C, GOTO does not explicitly teach (1) the substrate temperature being from 350 °C to 450 °C. Additionally, as noted previously, since GOTO also does not teach the carbon film containing ruthenium, GOTO also does not teach (2) the use of a source material comprising ruthenium dipivaloylmethanate. Finally, while GOTO teaches the varying of the oxygen concentration supplied to the substrate (see page 1021), GOTO does not explicitly teach (3) the carrier gas comprising greater than 9% and less than 23% oxygen as claimed.

(1) Substrate Temperature

However, KAWANO teaches a metalorganic CVD process in which the substrate temperature is varied from 200 °C to 750 °C (see ¶55). Moreover, KAWANO teaches that in performing the CVD process it is known that the substrate temperature has to be sufficiently high in order for the organometallic vapor to be heat-decomposed. Furthermore, as evidenced by GOTO II, the structure of the deposited film in a

metalorganic CVD process is known to vary depending on the temperature of the substrate (see figure 2 on page 210 and the accompanying discussion).

As a result, one of ordinary skill in the art would have appreciated and recognized the substrate temperature to be a result effective variable in the CVD process (see MPEP 2144.05 (II)) and as such finding the optimum substrate temperature for the CVD process to occur would only have required routine skill in the art.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to form the particle dispersed complex as claimed in which the substrate temperature is within the temperature range as claimed.

(2) Ruthenium Precursor

KAWANO also teaches that ruthenium dipivaloylmethanate is a known ruthenium organometallic compound used as precursors for thin film CVD processes (see ¶13). Moreover, in view of the reasoning as presented above, it would have been obvious to one of ordinary skill in the art to employ any of the known ruthenium precursor compounds as the source material in fabricating a ruthenium doped carbon film as a catalytic electrode for a solid electrolyte oxygen sensor.

(3) Oxygen Concentration

Additionally, as to the oxygen concentration employed in the CVD process, GOTO teaches that varying the oxygen concentration in the process resulted in particle-dispersed complexes having differing properties (see figures 10 and 11). GOTO also teaches that it is known in the art to adjust the amount of oxygen gas as a means of

controlling the carbon content of the resulting deposited film (see page 1017 under section titled "Experimental"). Additionally, even though the specific teachings of GOTO are relating to the CVD of iridium carbon complexes due to the similar properties of ruthenium one of ordinary skill in the art could reasonably expect ruthenium to exhibit similar trends when employed in the same process. Furthermore, as evidenced by SMITH, the control of the oxygen concentration in a metalorganic CVD process is also known to affect the rate of the deposition (see page 78).

As such, one of ordinary skill in the art would have appreciated and recognized the rate of oxygen to be added during the CVD process to be a result effective variable (see MPEP 2144.05 (II)) and as such finding the optimum oxygen concentration so as to provide the complex having the best electrical properties for use as an electrode while also providing for an adequate rate of deposition would have only required routine skill in the art.

Finally, as to structural aspects of the ruthenium particle amorphous carbon complex having the particle diameter and the morphology of the matrix and particles as claimed, such limitations are being treated as inherent since the particle dispersed complex made by the same process would necessarily result in a film having the same structure. Moreover, as discussed previously relating to the rejection of the product-by-process limitations of claim 15, the use of the same processing conditions would have been obvious to one of ordinary skill in the art and, as a result, the film produced by such a method would have also been obvious.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to substitute the use of ruthenium, as taught by JAIN, as the organometallic compound for the formation of a solid electrolyte oxygen sensor electrode in place of the iridium organometallic compound in the CVD method of GOTO as modified by KAWANO to obtain the predictable result of forming a ruthenium carbon complex for use as an electrode material having the structural properties as claimed.

Regarding claim 14, GOTO as modified by JAIN and KAWANO above does not explicitly teach the atomic number ratio of carbon to ruthenium in the particle-dispersed complex. However, since the GOTO as modified by JAIN teaches a similar CVD process employing similar conditions the resulting particle dispersed complex would necessarily result in a complex having the atomic number ratio as claimed.

Regarding claims 17, 18 and 20, GOTO as modified by JAIN and KAWANO teaches the particle dispersed complex wherein the complex is held on an electrically conductive substrate and a solid electrolyte substrate made of zirconium oxide with a stabilizing agent (see page 1017 teaching the metal carbon film being formed on yttria-stabilized zirconia a known conductive solid electrolyte substrate).

Regarding claim 19, GOTO as modified by JAIN and KAWANO above does not explicitly teach the particle dispersed complex having an interfacial electrical conductivity. However, since GOTO as modified by JAIN teaches the same process of

Art Unit: 1723

producing the complex as claimed, the resulting film would inherently possess the same interfacial electrical conductivity to that as claimed. MPEP §2112. See also *In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977).

Regarding claims 21 and 24, GOTO as modified by JAIN and KAWANO above teaches the particle dispersed complex wherein the complex is a sensor electrode of a solid electrolyte sensor and a solid electrolyte sensor having the particle dispersed complex as an electrode on the surface of a zirconia oxide stabilized solid electrolyte (see page 1019 and text continuing onto page 1021 discussing the use of the deposited film on the YSZ solid electrolyte in an oxygen concentration cell, i.e. an electrochemical oxygen sensor).

Regarding claims 22 and 23, GOTO as modified by JAIN and KAWANO above teaches the particle dispersed complex wherein the complex is an electrochemical catalyst (see discussion above relating to the inclusion of ruthenium in the amorphous carbon complex which similar to the iridium amorphous carbon complex would be expected to act as an electrochemical catalyst).

Response to Arguments

4. Applicant's arguments with respect to claims 1, 14, 15 and 17-24 have been considered but are moot in view of the new ground(s) of rejection.

Moreover, as to the previous grounds of rejection, the Examiner is of the opinion that the claim limitations as presently drafted requiring the matrix “consisting of carbon black” along with the limitation requiring the presence of ruthenium particles dispersed in and surrounded by the matrix wherein “every part of the entire surface of each of the particles makes contact with either the matrix or another of the particles” effectively functions to exclude the presence of any other particles in a film in which the other particles are randomly oriented within the carbon black matrix. Since the film of UENO is a diamond-like carbon (“DLC”) coating (see UENO at) that includes at least some randomly oriented diamond nanocrystals, as shown by LIAN (see LIAN at), within an amorphous or carbon black matrix having ruthenium, such a film would not meet the structural limitations of the claim as outlined above. Moreover, it is further noted that presence of the DLC is due to the differing CVD processes, i.e. an electron cyclotron resonance CVD process, employed by UENO and LIAN.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYAN D. RIPA whose telephone number is 571-270-7875. The examiner can normally be reached on Monday to Friday, 9:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1723

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/
Primary Examiner, Art Unit 1723

/B. D. R./
Examiner, Art Unit 1723